DOCUMENT RESUME

ED 064 381 TM 001 626

AUTHOR Maxey, James H.
TITLE A Two Group-Two Treatment Research Design.
NOTE 16p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Behavior Change; College Students; Control Groups; *Evaluation Methods; Hypothesis Testing; *Interaction Process Analysis; Literature Reviews; Preservice Education; *Research Methodology; *Sensitivity Training; Student Participation; Teacher Behavior; *Teacher Education; Teaching Styles; Verbal Communication

ABSTRACT

A two group-two treatment research design is presented; it allows for the assessment of the individual and the combined effects of the two treatments. Advantages include: (1) Initial evaluation represents an estimate of the stabilities of the measurements; and (2) Observation 4 compared with the average of Observation 1 and Observation 2 tests the sequential effects of the two treatments with a control group. An example of the use of the design is found in a study that sought to measure the effects of interaction analysis (IA) training and sensitivity training (ST) on the verbal teaching behavior of pre-service teachers. The point is made that interaction analysis training, if successful, would have led teachers to use appropriate styles of teaching. A review of the research is made, and ten hypotheses relating to the effect of interaction analysis training and sensitivity training on teacher behavior are stated. Twenty-one pre-service teachers participated in simulated teaching sessions in which they taught their peers at an appropriate college level. Observational data on teaching behavior was collected. Measurement remained constant during the control period, and significant changes for both groups occurred following the IA training. Conclusions include: (1) IA training influences verbal teaching style, while ST does not; (2) Subjects used more indirect methods of teaching; and (3) Student participation increased. (CK)

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

James H. Maxey
Georgia State University
33 Gilmer Street
Atlanta, Georgia 30303

A Two Group-Two Treatment Research Design

James H. Maxey
Georgia State University

ED 064381

A unique two group-two treatment research design is presented in this paper. The design allows for the assessment of the individual and the combined effects of the two treatments, for each group to serve as its own control group and for the internal replication of the experiment. An example is included in the paper showing how the design was used for the evaluation of an in-service training project. Also included are the appropriate techniques for analyzing data generated through the use of the research design. Credit must be given to Campbell and Stanley (1963) whose classical work on research design stimulated the author to develop this particular variation.

The design is represented in Figure 1.

Group 1	R	O_1	O_2	X_1	O_3	X_2	O_4	O_i = observation
Group 2	R	O_1	O_2	X_2	O_3	X_1	O_4	X_i = treatment

Figure 1. -- The Design

The design has the following advantages:

1. Since no training takes place between O_1 and O_2, changes during this period represent an estimate of the stabilities of the measurements. Also, this period of time serves as the control period of the experiment.

2. O_4 compared with the average of O_1 and O_2 tests the sequential effects of the two treatments with a control group. This feature has the practical advantage of permitting the researcher to use intact groups without being faced with the difficult task of justifying a quasi-experimental treatment or a control group to the population he is using for his experiment.

TM 001 626

3. O_3 for Group 1 compared with O_3 for Group 2 tests the differences between the two treatments.

4. O_4 for Group 1 compared with O_4 for Group 2 tests the sequential effect of the two treatments. However, an interpretation of the sequential effect must be tempered with the realization that there is only an n of 1 due to the fact that the unit of analysis in the research is the order of the two treatments.

5. The comparison of O_4 with O_3 for Group 1 tests the differential effect of the combined treatments as compared with treatment X_1. Likewise the comparison of O_4 with O_3 for Group 2 tests the differential effect of the combined treatments with treatment X_2.

6. The design provides for partial replication of the results within the one experiment. This is accomplished by comparing changes at O_4 for Group 2 and at O_3 for Group 1 to test tle effects of treatment X_1 and changes at O_4 for Group 1 and at O_3 for Group 2 for treatment X_2. Unless these growth patterns are similar the research cannot support the conclusion that the treatment is producing change. This feature is especially appropriate for multiple criteria variables where one expects differential effects for the two treatments.

7. The design is very flexible. It allows for complete random assignment of subjects to the two groups at the start of the experiment. Or, subjects can be pre-tested at O_1 and then assigned to the groups at O_2 which allows for a randomized blocking procedure. This procedure is especially useful if there is one or two major variables, that previous research or theory indicate are likely to have an interaction effect with the treatment. It also allows for the use of intact groups.

8. The practical advantages of being able to use intact group may be the strongest feature of the design. Educational researchers have been criticized and have met resistance in gaining access to the public schools. Part of the resistance is due to a natural conflict of interest between the researcher who is interested in tight experimental control and the administrator who is interested in having mimimum interruption of his school's daily routine. The administrator also wishes to guarantee all students the same educational opportunity. Consequently, such things as random assignment of the students to treatments and the use of a pure or quasi control group are often vetoed by the school administrator. The present design is attractive to the administrator because it makes use of intact classes, all subjects will have received the same treatment by the end of the experiment, and only the order of treatments will have varied.

Due to the type of design, the main effects in the ANOVAR between groups and between trials are confounded. Group 1 has received the influence of treatment X_1 for O_3 and O_4 while Group 2 has been influenced by treatment X_1 only for O_4. Likewise, Group 2 has been influenced by X_2 for O_3 and O_4, while Group 1 has been influenced by only for O_4. Therefore, if as hypothesized the treatments had differential effects with regards to different variables, then the interpretation of the main effects by groups and the main effects by trials would be confusing. Therefore, the ANOVAR is analyzed only to obtain an estimate of the error term and the differences between cells in the planned comparisons are used to test the specific hypotheses.

An Experimental Study

An example of the use of the design is found in a study that sought to measure the effects of interaction analysis training and sensitivity training on the verbal teaching behavior of pre-service teachers. A more detailed account of the study is found in the author's unpublished doctoral dissertation, Maxey (1970).

One unpublicized result of teacher strikes, student riots, racial conflict, and community dissatisfaction plaguing public education was the agonizing reappraisal by public school educators of the traditional emphasis on cognitive learning. Seeking more relevant alternatives, these educators demonstrated an increasing interest in affective learning and in the emotional development of students, a concern that caused them to re-examine the nature of teacher training programs. During the sixties sensitivity training and interaction analysis training were frequently mentioned as desirable components of teacher preparation. But it was not fully determined in what way, if any, experience in either or both of these techniques affected a teacher's performance in the classroom.

Since interaction analysis and sensitivity training were being used in teacher preparation programs with increasing frequency, it was important to know if either or both of these training methods affected a teacher's verbal performance. Based on the desired results of sensitivity training one would have expected teachers, after being trained, to be more expressive of their feelings, more attuned to the feelings of their students, and more inclined to use a democratic form of leadership in the classroom.

Interaction analysis training, if successful, would have led teachers to use appropriate styles of teaching which would include the use of more indirect styles of influence. This, in turn, would have led to greater student participation. The study was an attempt to detect changes of the above types in a teacher's verbal performance in a teaching situation.

The following questions represent the major focuses of inquiry of the study:

1. Does training in ST and IA change the verbal teaching patterns of pre-service teachers?

2. After training in ST and IA do pre-service teachers tend to use more indirect styles of influence?

3. After training in ST and IA do pre-service teachers become more expressive of their own feelings and more accepting of the feelings expressed by students?

Review of Research

Only one study, Hough and Ober (1966), was found that examined the effect of interaction analysis and human relations training on the verbal behavior of pre-service teachers. The Hough and Ober study involved 420 subjects who were taking a general methods course for secondary school teachers at Ohio State University. The researchers found that students who were taught IA were clearly different in their verbal teaching behavior from those not taught this skill. The subjects taught in this group used more indirect styles of influence such as praise, use of student's ideas, and questioning; and fewer direct styles of influence such as lecturing and criticism. In general, there were no overall changes in subjects who

received any of the three forms of human relations training. The investigators mentioned their most provocative finding was that the group receiving both formal training in IA and the dyadic human relations program made significantly greater use of accepting and clarifying student ideas. In a follow-up study by Lohman, Ober and Hough (1967) a year later, 60 of the subjects who had received IA training were observed doing their student teaching. In general the students continued to exhibit more indirect styles of teaching than a similar control group.

Since Flanders (1970), Coats (1966), Morrison (1966), and LaShier (1965) all found that teachers' I/D ratios were related to higher student achievement and positive student attitudes, it would indicate that I/D ratios are an important dependent variable to consider in the study of teacher verbal interaction. I/D ratios refer to the amount of time the teacher spends on direct behaviors (accepting feelings, praising, using student ideas, and questioning) compared to the amount of time spent on direct behaviors (lecturing, giving directions, and criticizing). In order to make further distinctions among teachers with similar I/D ratios, data concerning the amount of teacher time spent on questioning and the amount of student participation is included. While it is true that all of these studies had limitations in terms of sampling and generalizability, there is enough evidence to indicate that their findings should receive attention in the planning of further research.

House (1967), Harrison (1967) and Campbell and Dunnette (1968), after extensive reviews of the effects of sensitivity training, reported that they were unable to support either the extreme critics or proponents in the debate about the effectiveness of laboratory training. Practitioners and participants consistently reported favorable changes in concern, openness,

authenticity and expressed the opinion that ST was of personal value. However, they were unable to find consistently any large or significant overall changes in any specific direction.

Specific Hypotheses

Hypothesis One

Pre-service teachers who received both interaction analysis training and sensitivity training would use a more indirect style of influence in simulated teaching sessions than untrained pre-service teachers.

Hypothesis Two

Pre-service teachers who received both interaction analysis training and sensitivity training would verbalize their own feelings and accept the feelings of students more often in simulated teaching sessions than untrained pre-service teachers.

Hypothesis Three

Pre-service teachers who received both interaction analysis training and sensitivity training would use a more indirect style of influence in simulated teaching sessions than pre-service teachers who received only interaction analysis training.

Hypothesis Four

Pre-service teachers who received both interaction analysis and sensitivity training would verbalize their own feelings and accept the feelings of students more often in simulated teaching sessions than pre-service teachers who received only interaction analysis training.

Hypothesis Five

Pre-service teachers who received both interaction analysis training and sensitivity training would use a more indirect style of influence in simulated teaching sessions than pre-service teachers who received only sensitivity training.

Hypotehsis Six

Pre-service teachers who received both interaction analysis training and sensitivity training would verbalize their own feelings and accept the feelings of students more often in simulated teaching sessions than pre-service teachers who received only sensitivity training.

Hypothesis Seven

Pre-service teachers who received interaction analysis training would use a more indirect style of influence than pre-service teachers who received sensitivity training.

Hypothesis Eight

Pre-service teachers who received sensitivity training would verbalize their own feelings and accept the feelings of students more often in simulated teaching sessions than pre-service teachers who received interaction analysis training.

Hypothesis Nine

The order of training for pre-service teachers who received both interaction analysis training and sensitivity training would make no significant difference in their use of indirect styles of influence.

Hypothesis Ten

The order of training for pre-service teachers who received both interaction analysis training and sensitivity training would make no significant difference in their verbalizing of their own feelings and in their acceptance of the feelings of students.

Procedure

Twenty-one pre-service teachers, all of whom were juniors in college taking their first education course, participated in simulated teaching sessions in which they taught their peers at an appropriate college level. The sensitivity training was a twelve-hour workshop that was designed to work on laboratory learnings that were directly related to teaching. There was special emphasis on the expression and acceptance of feelings in the classroom situation. The interaction analysis training was a twelve-hour workshop based on Flanders' interaction analysis that included learning how to code and interpret verbal teaching behavior. There was special emphasis on experimenting with various forms of verbal teaching behavior.

Observational data on teaching behavior of the subjects was collected four times over a twelve-week period. Between the second and third trials one group received interaction analysis training while the other group received sensitivity training. Between the third and fourth observation the treatments were reversed. A two-way, fixed model, analysis of variance for repeated measures with a subsequent set of planned comparisons was used to analyze the dependent variables. The two primary dependent variables were

indices of indirect teaching (use of praise, student ideas and questioning) and of teacher verbal expression of feelings.

Interaction analysis was the primary means of data collection. It was used to code all verbal behavior during the simulated teaching sessions. The particular observational system used in this study was a slight revision of Flanders' (1966) basic ten category system. Two additional categories were added for recording teacher expression of his own feelings and for the student expression of feelings.

In addition, each analysis of variance was followed by a set of eight planned comparisons. These comparisons were for the direct testing of the specific hypothesis. Table 1 shows the coefficients for the eight planned comparisons and which hypothesis they were testing.

TABLE 1

COEFFICIENTS FOR PLANNED COMPARISONS RELATED TO SPECIFIC HYPOTHESES

Planned Comparison	Coefficients by Cell	Hypothesis Tested
1st	$1/2(A_1B_1)+1/2(A_1B_2)+1/2(A_2B_1)+1/2(A_2B_2)-1(A_1B_4)-1(A_2B_4)$	1 & 2
2nd	$-1(A_2B_3)+1(A_2B_4)$	3 & 4
3rd	$-1(A_1B_3)+1(A_1B_4)$	5 & 6
4th	$1(A_1B_3)-1(A_2B_3)$	7 & 8
5th	$-1(A_1B_4)+1(A_2B_4)$	9 & 10
6th	$1(A_1B_1)-1(A_1B_2)+1(A_2B_1)-1(A_2B_2)$	All
7th	$1/3(A_1B_1)+1/3(A_1B_2)+1/3(A_1B_3)-1(A_1B_4)$	7 & 8
8th	$1/2(A_2B_1)+1/2(A_2B_2)-1/2(A_2B_3)-1/2(A_2B_4)$	7 & 8

Analysis of Data

The reader is reminded that I/D ratios refer to the amount of time the teacher spends on indirect behaviors compared to direct behaviors. Indirect behaviors included acceptance of student's feelings, praise, use of student ideas, and questioning. Direct behaviors included lecturing, giving directions and criticizing. The cell means, which are presented in Table 2, were considerably higher after each group had received interaction analysis training.

TABLE 2

CELL MEANS FOR I/D RATIOS

Group by Trial	B_1 (Trial 1)	B_2 (Trial 2)	B_3 (Trial 3)	B_4 (Trial 4)
A_1 (Experimental Group 1)	0.0834	0.0480	0.0791	0.4318
A_2 (Experimental Group 2)	0.0671	0.0842	0.7985	0.6620

The results of the ANOVAR of I/D ratios are summarized in Table 3. It was observed that the trial by group interaction was significant (p=0.0014).

TABLE 3

SUMMARY OF ANALYSIS OF VARIANCE FOR I/D RATIOS

Source	SS	df	MS	F	P
Between	2.4773	20	0.1239		
Groups	1.2309	1	1.2309	18.7650	0.0006
Error (G)	1.2463	19	0.0656		
Within	10.9579	63	0.1739		
Trials	3.7011	3	1.2337	12.8067	0.0000
G by T	1.7658	3	0.5886	6.1102	0.0014
Error (T)	5.4910	57	0.0963		
Total	13.4352	83	0.1619		

The results from the subsequent planned comparisons are summarized in Table 4.

TABLE 4

PLANNED COMPARISONS FOR I/D RATIOS

Planned Comparison	Description	F
1st	No Training vs. Combined Treatment	30.86**
2nd	Both Treatments vs. IA	0.97
3rd	Both Treatments vs. ST	7.10*
4th	IA vs. ST	39.55**
5th	Between Groups after Both Treatments	3.86
6th	Stability of Measure	0.006
7th	Effect of IA for Group 1	11.24**
8th	Effect of IA for Group 2	44.47**

*p < .05 ** p < .01

Significant differences were obtained in each of the following contrasts; those groups that had received (IA + ST) compared with those that had received ST; those that had received IA training compared with those that had received ST; the effects of IA training for Group 1; and the effects of IA training for Group 2.

No significant differences were obtained in each of the following contrasts: those groups that had received (IA + ST) compared with those that had received IA; between groups after (IA + ST); between trial 1 and trial 2 during the control period of the experiment.

In summarizing the results of the analysis of the I/D ratios, it was noted that the measurement remained relatively constant during the control period and that the significant changes for both groups occured immediately following the IA training. This seemed to indicate that ST had little influence on the I/D ratios, that the IA training influenced I/D ratios in a positive direction, and was as influential as the combined treatments.

Analysis of the data for the expression and acceptance of feelings revealed interesting results. The TEF referred to the expression of the teachers' own feelings that dealt with the current classroom process and the verbal acceptance of students' feelings in a non-threatening way. The definition was restricted to those verbal statements that dealt with the process that was currently going on in the classroom and not to statements of feeling about topic, the past, or the future.

The TEF was infrequent, occurring for a duration of three seconds or longer in only eleven out of eighty-four fifteen-minute observations. The eleven occurrences of this event were distributed in the following manner: five times during trial 1; one time during trial 2; one time during trial 3; and four times during trial 4. Due to the low frequency it was impossible to get a good representation of the error term and any differences were likely to be statistical artifacts. Also, the effect of the measure being near zero truncated the variance which would lead to artificial differences. Therefore, no formal analysis was attempted. The important information was that this behavior seldom occurred and that there was no pattern to its occurrence, leading to the conclusion that neither treatment influenced the TEF.

SEF was defined as expression of feelings verbalized by the student that dealt with the current classroom process. This behavior failed to occur in seventy-one out of eighty-four observations. The thirteen occurrences of this event were distributed in the following manner: three times during trial 1; one time during trial 2; one time during trial 3; and eight times during trial 4. Based on the same logic described in the preceeding section, no further analysis was done. It was interesting to note that this event

happened most often after the subjects had received the combined treatment. However, it was concluded that the data were insufficient to warrant a conclusion about which treatment, if any, influenced it.

Conclusions

The results of this study led to the following general conclusions:

1. There was strong evidence to support the conclusion that interaction analysis training influenced the pre-service teachers to change their verbal teaching style.

2. There was evidence to support the conclusion that sensitivity training had little or no influence on the verbal teaching style of the pre-service teachers.

3. There was evidence to support the conclusion that interaction analysis training by itself was as effective as the combination of both sensitivity training and interaction analysis training.

The nature of the changes after IA training were the following:

1. The subjects tended to use more indirect methods of teaching. This indirect style included more frequent praise, more frequent use of students' ideas for an extended period of time and an increase in their use of questioning.

2. The subjects tended to lecture and give directions less often.

3. Associated with the above changes in teachers' behavior was a large increase in the amount of student participation.

List of References

Campbell, D. T. and Stanley, J. C. Experimental and quasi-experimental designs for research on teaching. "Handbook of Research on Teaching." Gage, N. L. (Ed.) Chicago: Rand McNally & Co., 1963, 171-246.

Campbell, J. P. and Dunette, M. D. Effectiveness of T-group experience in managerial training and development. Psychological Bulletin, 1968, 70, 73-104.

Coats, William D. Investigation and simulation of the relationships among selected classroom variables. (Doctoral dissertation, The University of Michigan) Ann Arbor, Mich.: University Microfilms, 1966, No. 67-8228.

Flanders, N. A. Analyzing classroom interaction. Reading, Mass.: Addison-Wesley Publishing Company, 1970.

Harrison, R. Problems in the design and interpretation of research on human relations training. Unpublished paper presented to research seminar of V. A. Hospital in West Haven, Conn., 1967.

Hough, J. B. and Ober, R. The effect of training in interaction analysis on the verbal teaching behavior of pre-service teachers. Amidon, E. J. and Hough, J. B. (Eds.) Interaction analysis: theory, research, and application. Reading, Mass.: Addison-Wesley, 1967, 329-345.

House, R. J. T-group education and leadership effectiveness. Personnel Psychology, 1967, 10, 1-32.

LaShier, William S., Jr. An analysis of certain aspects of the verbal behavior of student teachers of eighth-grade students participating in a BSCS laboratory block. (Doctoral dissertation, University of Texas) Ann Arbor, Mich.: University Microfilms, 1966, No. 66-1938.

Maxey, James H. "The Effects of Interaction Analysis Training and Sensitivity Training or The Verbal Teaching Behavior of Pre-Service Teachers". Unpublished doctoral dissertation, The University of Michigan, 1970.

Morrison, Betty Mae, The reactions of internal and external children to patterns of teaching behavior. (Doctoral dissertation, The Unisity of Michigan) Ann Arbor, Mich.: University Microfilms, 1966, No. 66-14,560.